**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study) **Ecotoxicology and environmental safety** | ECTS**2** | Component code**ENVI 4.3** |
| Name in Polish**Ekotoksykologia i bezpieczeństwo środowiskowe** |
| Unit(-s) providing the course/module (Faculty, Institute/Department)**Faculty of Environmental and Mechanical Engineering, Department of Ecology and Environmental Protection**  |
| Head of course/module (e-mail address)**Maria Drapikowska, Prof. UPP (****maria.drapikowska@up.poznan.pl****)** |
| Other teachers**Marcin Spychała, PhD** |
| Course category**Open** | Language**English** | Level**Bachelor/Master** | Profile**Academic-general** | Semester**Winter** |
| **TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS**(organised classes/lectures and self-study) |
| Type of studies: full-time |  | Type of studies: extramural |  |
| * lectures
 | 15 | * lectures
 | - |
| * practical classes
 | 0 | * practical classes
 | - |
| * field exercise
 | 0  | * field exercise
 | - |
| * other lessons
 |  - | * other lessons
 | - |
| * self-study
 |  35 | * self-study
 | - |
| Total number of hours: | 50 | Total number of hours: | - |
| **PRE-REQUSITES**Basics of environmental sciences and biology. |
| **OBJECTIVE OF COURSE/MODULE**This subject will provide general understanding of toxicology related to environment. The course includes the knowledge about basic toxic compounds for living organisms; absorption of toxicants, distribution and storage of toxicants and methods of detection of environmental contamination. The environmental impact of toxic substances will be characterized. In particular the sources of toxic substances in wastewater and their impact on treatment processes will be analysed. The influence of toxic substances in treated wastewater on water environment will be discussed and verified practically (the opportunity for it will be the visiting of wastewater treatment plant). |
| **TEACHING METHODS**Lectures based on multimedia presentation with elements of discussion.Possibility to use distance learning tools and techniques. |
| **LEARNING OUTCOMES** | Referenceto field outcomes |
| Knowledge | O1: Students will have advanced knowledge about occurrence and significance of major environmental toxicants.O2: Students will know fundamental information of processes in living organisms associated with exposure to toxic agents.O3: Students will be able to gather information on environmental threats in the selected area, to identify hazards and propose corrective actions including innovative environmental technologies. | Notapplicable |
| Skills | O4: Students will have skills to carry out simple scientific tasks under university teacher supervision.O5: Students will be able to carry out simple toxicological tests.O6: Student able to find and use relevant information from literature and databases. | Notapplicable |
| Socialcompetences | O7: Students will understand the need for continuous learning, will be able to inspire and organize learning processes of other people.O8: Students will be able to cooperate and work in a team, both as a leader and a member of a team.O9: Students will be able to establish proper priorities connected with solving tasks being defined by a student or others. | Notapplicable |
| **METHODS TO VERIFY LEARNING OUTCOMES**Writing exam includes the content of the lectures.Written report.  | Outcome ReferenceNumbersO1 – O9 |
| **TEACHING CONTENT****Lectures**: 1. Introduction to ecotoxicology; aims and tools, groups of environmental contaminants.
2. Pollutant sources. Gaseous air pollutants: ozone, sulphur dioxide, carbon dioxide, nitrogen oxide – deposition impact on vegetation.
3. Bioaccumulation, effects in organisms, populations, ecosystems.
4. Sources of toxic substances in wastewater.
5. Impact of toxic substances in wastewater on treatment processes.
6. Influence of toxic substances in treated wastewater on water environment.
7. Improvement of environmental safety
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| **Forms and criteria for passing of course/module** Written individual report. Final written exam.  | Percentage of final mark30%70% |
| **LIST OF LITERATURE** 1. Newman M.C., Clemens W.H., 2008. Ecotoxicology. A comprehensive treatment. CRB Press.
2. Lorris G. Cockerham, Barbara S. Shane, L.G. Cockerham, L. G. Cockerham. 1993. Basic Environmental Toxicology.
3. Venkatesan A.K., Halden R.U. (2014) Wastewater Treatment Plants as Chemical Observatories to Forecast Ecological and Human Health Risks of Manmade Chemicals. Scientific Reports, (4), 3731, 1-7.
4. Bennett G.F. (1989) Impact of Toxic Chemicals on Local Wastewater Treatment Plant and the Environment. Environ Geol Water Sci Vol. 13, No, 3, 201-212.
5. Brown N. J. (1997). Health hazards manual: Wastewater treatment plant and sewer workers. Ithaca, NY: Cornell University, Chemical Hazard Information Program.
6. Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants. Office of Wastewater Management U.S. Environmental Protection Agency, 1999, Washington, D.C. 20460.
7. Walker C.H., Sibly R.M., Hopkin S.P., Peakall D.B. Principles of Ecotoxicology, Fourth Edition, CRC Press, 2012.
8. Rand G.M. Fundamentals of Aquatic Toxicology Taylor &amp; Francis, Washington, 1995.
9. Vallero D. A. Environmental Biotechnology, Biosystems Approach. Elsevier, AP. Amsterdam, Boston, 2010.
10. Bitton G. Wastewater Microbiology. Willey. New Jersey, 2011.
11. Reisner D. E. (ed.) Bionanotechnogy. Global Prospects. CRC Press. Boca Raton, 2012.
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